Analysis of Boolean Functions, 7.5 hp

Course period:
September 3, 2018-October 19, 2018

Last day for application:
March 19, 2018

Course leader / Address for applications:
Jeff Steif / steif@chalmers.se

Course description (Advertisement for Ph.D. students):

The aim of this course is to cover a number of topics in the theory of Boolean functions. This area is a combination of probability theory, analysis, combinatorics and theoretical computer science.

The course will run in the first reading period, fall 2018. The course will run twice a week (2 hours each time). The schedule will be decided with the participants input.

Responsible department and other participation departments/organisations:
Mathematics Department

Teacher:
Jeff Steif

Examiner:
Jeff Steif

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1. Confirmation
The syllabus was confirmed by the Head of the Department of XXX 200X-XX-XX, 200X-XX-XX.

Disciplinary domain: Science
Department in charge: Department of Mathematical Sciences
Main field of study: Mathematics

2. Position in the educational system
Ph.D. course.

3. Entry requirements
The student should have some (but probably doesn't need alot) background in probability theory, combinatorics and analysis.

4. Course content
The aim of this course is to give an overview of the theory of Boolean functions. These arise in probability theory, combinatorics and theoretical computer science. Some topics which will be covered are the notions of influence, noise stability and sensitivity, randomized complexity in theoretical computer science and Arrow's Theorem. Two key tools will be Fourier analysis on the hypercube and hypercontractivity; no background concerning Fourier analysis and hypercontractivity will be assumed.

5. Outcomes
At the end of the course, the students will have acquired knowledge concerning the central parts of the theory of Boolean functions.

6. Literature

The primary book for the course is "Analysis of Boolean functions" by Ryan O'Donnell. The secondary book for the course is "Noise sensitivity of Boolean functions and percolation" by Christophe Garban and Jeff Steif.

7. Assessment
There will be a few homework assignments and an oral exam at the end of the course.

A Ph.D. student who has failed a test twice has the right to change examiners, if it is possible. A written application should be sent to the Department.

In cases where a course has been discontinued or major changes have been made a Ph.D. should be guaranteed at least three examination occasions (including the ordinary examination occasion) during a time of at least one year from the last time the course was given.

8. Grading scale
The grading scale comprises Fail, (U), Pass (G)

9. Course Evaluation
The course evaluation is carried out together with the Ph.D. students at the end of the course, and is followed by an individual, anonymous survey. The results and possible changes in the course will be shared with the students who participated in the evaluation and to those who are beginning the course.

10. Language of instruction
The language of instruction is English.